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Joseph O'Donnell

Bonnie Glassberg
University at Buffalo

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Joseph B. O'Donnell and Bonnie C. Glassberg
Management Science and Systems Department
School of Management, University at Buffalo
jbo1@acsu.buffalo.edu, bglass@acsu.buffalo.edu

Abstract

Extranets are an emerging interorganizational system (IOS) that is expected to surpass EDI in electronic commerce volume. Although extranets appear to have great potential for business use, they have received little attention in academic research. They offer free form text, graphics, sound and video, greater communication functionality, low technical requirements and relatively low adoption costs in comparison to other types of IOS. Except for security issues, such as encryption the technology is readily available for large and small organizations around the world. This paper focuses on Extranets, but provides an overall typology of web based and EDI systems. Prior electronic commerce literature is analyzed and compared to extranet technology. The unique characteristics of global extranets provide international research opportunities in the areas of system benefits, type of information exchanged, level of partnership system access, antecedents for adoption, and emerging forms of IOS partnerships.

Overview of Electronic Commerce

Research in the electronic commerce area has addressed the changing market place, electronic commerce structures and resulted in several theoretical models. Kalakota and Whinston (1997) have described electronic commerce as interorganizational, intra-organizational and customer to business. Extranets encompass both interorganizational and customer to business areas. Applegate, McFarlan and McKenney (1996) identify a trend of proprietary IOS architecture replaced by ubiquitous platforms for electronic commerce. They refer to the movement from proprietary systems such as American Airlines SABRE System to the open system environment of the internet. The Extranet parallels the above literature in that it represents an unbiased open system, which allows organizations to share information and provide value-added products.

Electronic Commerce Partnerships

IOS have facilitated four types of business information partnerships in electronic commerce. (Applegate, et. al. 1996). First, joint marketing partnerships, where companies coordinate with rivals to gain access to new customers and territories. Second, intra-industry partnerships involve exchanges between companies providing complimentary services. Third, buyer–seller partnerships are established by sellers to service their customers. Finally, information technology (IT) vender driven partnerships bring the vendor's technology to new markets. Extranets certainly are capable of facilitating the four partnerships described above. In addition, the author's propose a fifth type of partnership, product/service certification, involving an entity and an outside organization rating company that evaluates the entity's products and services. The certifying agency would select the best companies and products to further their reputation.

Comparison of Extranets to Internet Web sites, Intranets and EDI

An extranet exists when a company offers password-protected, limited access to a portion of its intranet to select companies outside the firewall, to provide external communications, document exchange and even collaborative design (Lange 1996). Analyzing differences and similarities among IOS and web based systems is useful for scholars planning research. See Table 1 for a comparison of Internet Web sites, Intranets, Extranets and EDI systems based on the following characteristics: Interacting Parties, Nature of Activity, Types of Information Communicated, Security, Flexibility, Complexity/Cost of Technology, IOS Level and Global Issues.

The internet involves an entity and the general public, the intranet involves parties within an organization, and the extranet and EDI involve an entity with its business partners. Multi-format information transfer is possible on all three web based systems but is restricted in EDI. The intranet and extranet provide interactive communication whereas EDI handles single format transactions. Intranet transactions are initiated and processed internally, while the other systems involve outside parties at the initiation or completion of the transaction. The intranet contains the most confidential information, the internet has the least and the extranet and EDI are in the middle. EDI handles detail confidential information such as purchase and sales dollar amounts and quantities but does not contain aggregated confidential information that is maintained on an extranet.

Security and confidentiality of information are also critical attributes of these systems. Figure 1 presents varying levels of system security in relation to two company firewalls. The internet, is the least secure as it

resides outside the external firewall. The extranet is a more secure environment, operating between the inner and outer firewall. The intranet is the most secure web based system operating behind the internal firewall. EDI transactions penetrate the inner firewall, but this is a one-way exchange where only the transaction reaches the host organization.

Barrett and Konsynski (1982) developed a model of inter-organization information sharing using five different levels. At the lowest level, there is remote input to, and output from another organization's system. The fifth and highest level involves a data communication facility processing transactions in a real-time mode. Internet sites are considered a level-3 IOS, sharing networks where organizations use the worldwide web to transfer information. The intranet is not applicable to this model, as it is not an interorganizational system. EDI also represents a level-3, "network sharing system" as it provides limited types of transactions in a shared network. Conversely, extranets are a level-5 IOS with an integrated network node involving multiple applications.

Global web based and EDI systems face unique issues not encountered by U.S. domestic systems. The first issue relates to transactional security. The U.S. Department of Defense has placed restrictions on the length of exported encryption due to national security concerns (Kalakota and Whinston 1997). In addition, all of these systems must address cultural, language, currency, time zone and local country law differences. These differences may require the web based systems to develop customized web sites for different countries. EDI must address currency and legal differences, but may not require customized EDI formats for cultural and language issues. A country's technological infrastructure impacts the reliability of systems and the potential for different protocol standards. Interestingly, a global developer of extranets estimates that it takes three times longer to development a non-U.S. site than a U.S. site (Dalton 1998).

The issue of protecting intellectual property rights affects all the systems but is most critical to the extranet environment. Countries vary in level of enforcement of intellectual property rights. Establishing extranets with partners from less stringent countries potentially involves an increased risk of unauthorized use of confidential information and theft of intellectual property. This risk potentially could impact the level of trust between global partners.

Differences Among Extranet Sites

Differences among extranet sites also exist. For example, information access varies among extranet sites and partnership relationships. Although extranets offer many potential benefits, two major factors, security concerns and bandwidth have restricted their growth (Hof, McWilliams and Salveri 1998; Horowitz 1998). The bandwidth concerns relate to global video and teleconferencing transmissions. The security concerns relate to the risks of allowing partners behind the outer firewall.

IOS Literature and EDI

Iacova, Benbasat and Dexter (1995) found that small firm adoption of EDI depended on three major factors: organizational readiness, external pressures to adopt and perceived benefits. Organization readiness refers to the firm's financial and technological resources. Financial resources relate to the availability of funds to pay for the EDI implementation. Technological readiness refers to the sophistication of IT usage and IT management. Two major sources of pressure to adopt are competitive pressure and imposed pressure by trading partners.

Hart and Saunders (1998) analyzed the interplay between power and trust in relation to EDI use. These researchers found that a higher trust between partners correlated with more diverse use of EDI. Conversely, customer power was found to have mixed relationships with the volume of EDI use.

Future Extranet Research

The above analysis has generated unanswered questions and opportunities for new research on global extranets in regards to: IOS benefits, confidentiality and type of communicated information among partners, level of partner system access, antecedents for IOS adoption, and emerging forms of electronic partnerships. Research on *IOS benefits*, can investigate relationships between the extranet's unique IOS characteristics and the resulting IOS benefits. For instance, will the extranet's multi-media communication forms lead to stronger partnerships and greater economic benefits? In addition, how will cultural and language differences impact these multi-media forms? Proprietary IOS such as American Airlines SABRE system provided opportunities for competitive advantage through channel control. Will the open systems architecture of the extranet provide global opportunities for competitive advantage through other means such as value added services?

Confidentiality and type of information could be analyzed in relation to the strength of the business partnerships. For instance, is strength of business partnership a key indicator of the willingness of partners to exchange confidential information? Is there a relationship of strength of partnership and the cultural background of the global partners? Further analysis should be extended to the *level of information access* provided by the host to the business partner. Finally, as firms become involved in a greater number of separate extranets, is there a greater risk of confidentiality of information being violated? Does the risk vary based on the partner's country of origin? Also, are there legal and

ethical issues in transferring information obtained from one global partner to another?

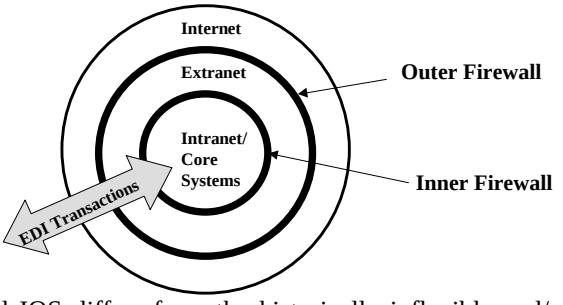
Studying the impact of trust and power on global extranet adoption may indicate a change in *antecedents to IOS adoption*. An underlying component of EDI adoption is the cost and organizational readiness to use the technology. The extranet's relatively low cost and simple technology minimizes these issues to some extent. Also, EDI adoption is dependent on both business partners adopting the technology. Conversely, for extranets the burden is on the host in adopting and supporting the site. A critical element of allowing extranet access is the trust among global partners. Identifying mechanisms that foster trust in cross-cultural extranet partnerships is an abundant area for further research. Finally, partnership trust and power should be analyzed in regards to *new forms of electronic partnerships* such as global product/service certification partnerships.

Conclusion:

Further empirical research of extranets is merited. The extranet has unique attributes in comparison to internet web sites, intranets and EDI especially when considering the global environment. This flexible, open

Figure 1

Security Structure



based IOS differs from the historically inflexible and/or proprietary IOS. Further investigation into global extranets will enable researchers to develop a better understanding of its benefits, type of information exchanged, level of system access, antecedents for adoption, and emerging forms of IOS partnerships using them. In addition, practitioners could benefit from this information by understanding the differences among these types of systems and how to properly apply them to their operating environment.

References available upon request from first author.

Table 1

Typology of Web based and EDI Systems

	Internet Web Site	**Intranet**	**Extranet**	**EDI**
Interacting Parties	Entity with the general public	Parties within an entity	Entity with business partner	Entity with business partner
Nature of Activity	Multi-format information transfer Electronic market place	Multi-format information transfer Interactive communication	Multi-format information transfer Interactive communication Electronic market place	Single format unidirectional information transfer Electronic market place
Types of Information Communicated	Financial Transactions Product/service offerings Advertising Organizational information Non-confidential information	Financial transactions (internally generated) Product/service offerings Organizational information Confidential information	Financial transactions Product/service offerings Advertising Organizational information Limited confidential information	Financial Transactions Purchase order/sale Confidential information
Security	Blocked by outer firewall	Behind inner firewall	Between outer and inner firewall	Transactions allowed past inner firewall
Flexible/rigid information format	Flexible	Flexible	Flexible	Rigid
Complexity/ Cost of Technology	Simple – low cost; limited changes to core systems	Simple – low cost; limited changes to core systems	Simple – low cost; limited changes to core systems	Complex – costly; requires changes to core systems
IOS Level Barrett & Konsynski's (1982)	Level 3 – Network sharing	Not applicable	Level 5 – Network sharing with multiple applications in real-time	Level 3 – Network sharing but limited to commerce transactions
Global Issues	Cultural differences Language Foreign exchange Technology infrastructure Legal issues Encryption standards	Cultural differences Language Foreign exchange Technology Infrastructure Legal issues Encryption standards	Cultural differences Language Foreign exchange Technology infrastructure Legal Issues Encryption standards Intellectual property rights	Language Foreign exchange Technology Infrastructure Legal issues Encryption standards